Isolated Snow Bands on March 22, 2004

An Example of Lake-enhanced Snow?

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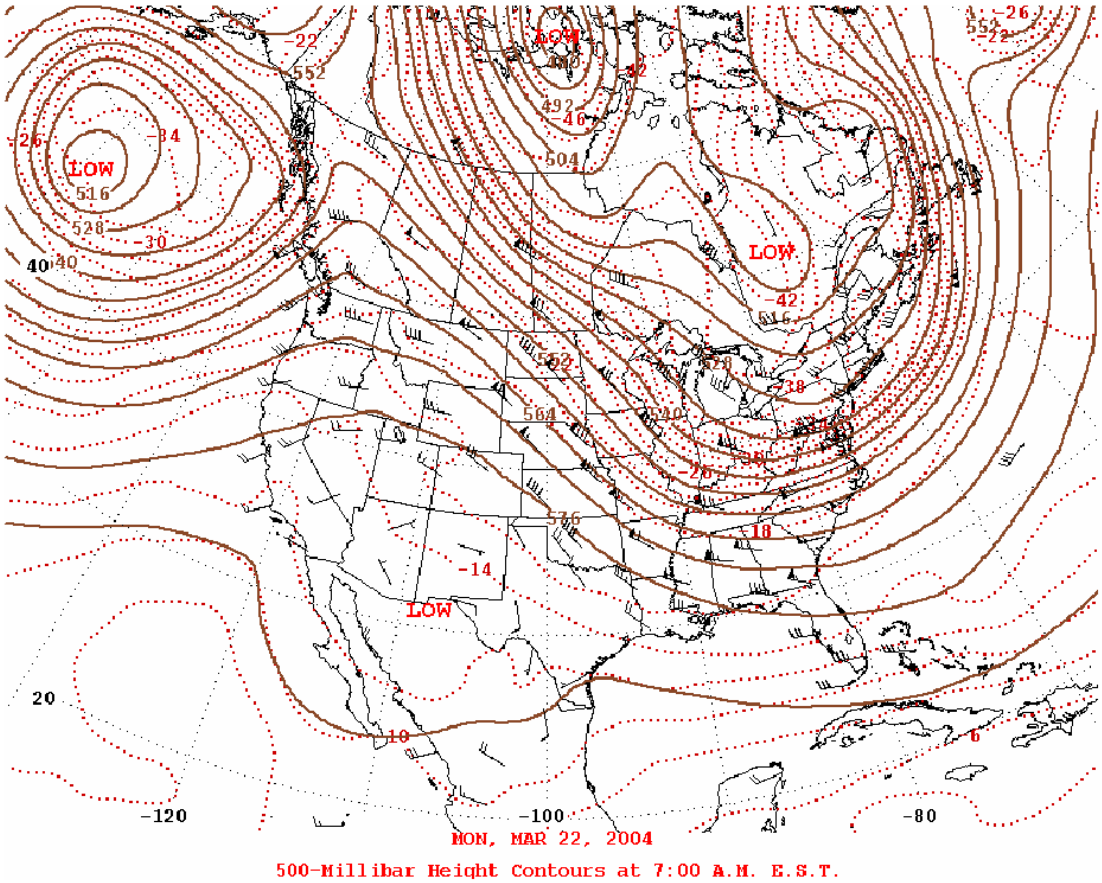
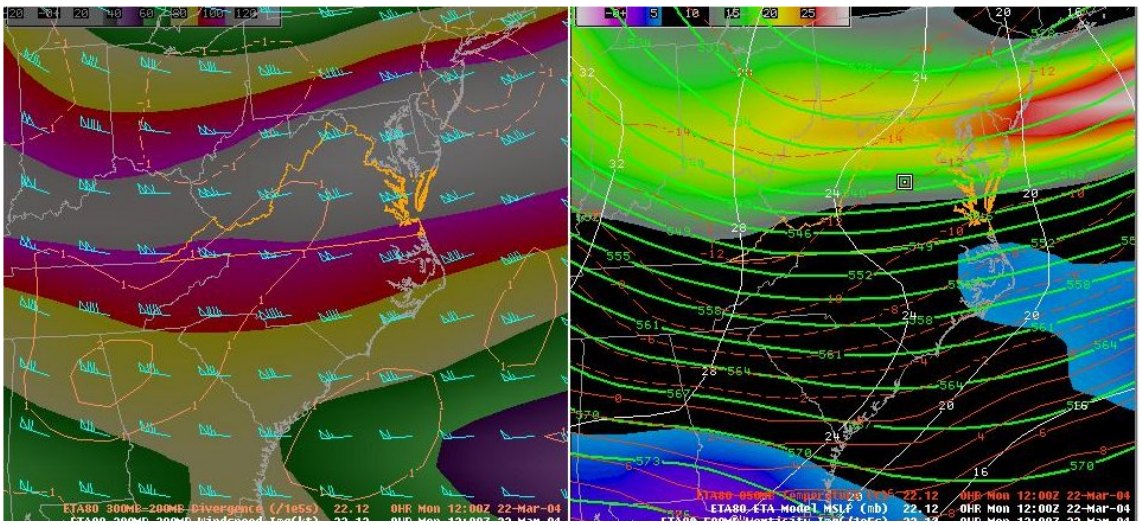
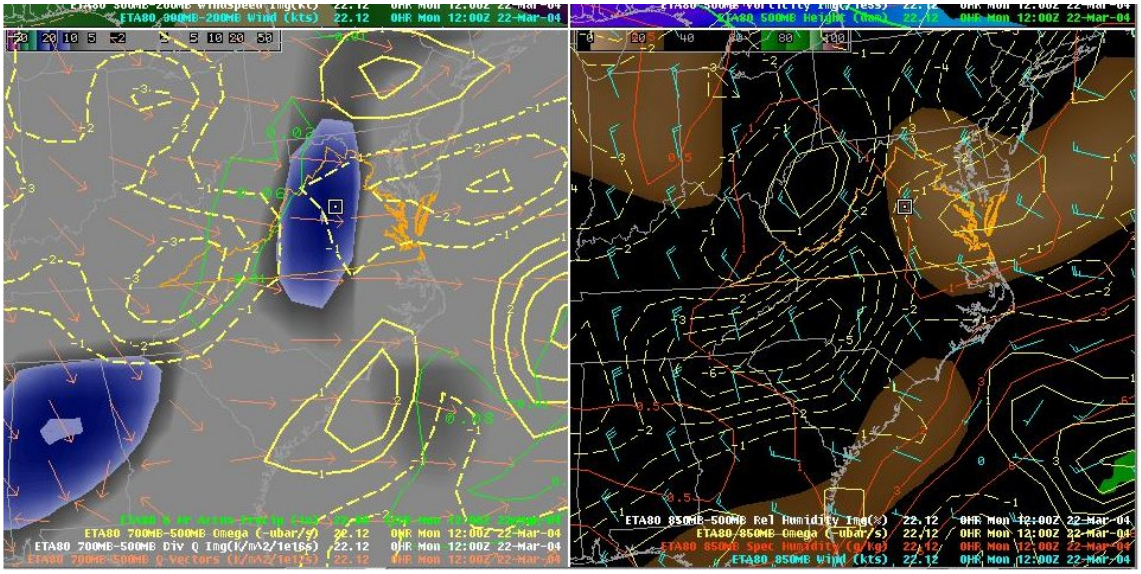
A late season cold air mass across the Appalachians resulted in bands of snow showers and flurries in the typical upslope regions of Southwest VA and Southeast WV. However as the last surge of cold air was working through the region...early morning bands of heavy snow developed over parts of the New River Valley. These bands were very narrow but did pile up a quick 1 to 2 inches of snow in short swaths in under a couple of hours. These radar images taken from the Nexrad Radar at Blacksburg(KBCB) depict the evolution of the short lived early morning snow event of March 22, 2004.

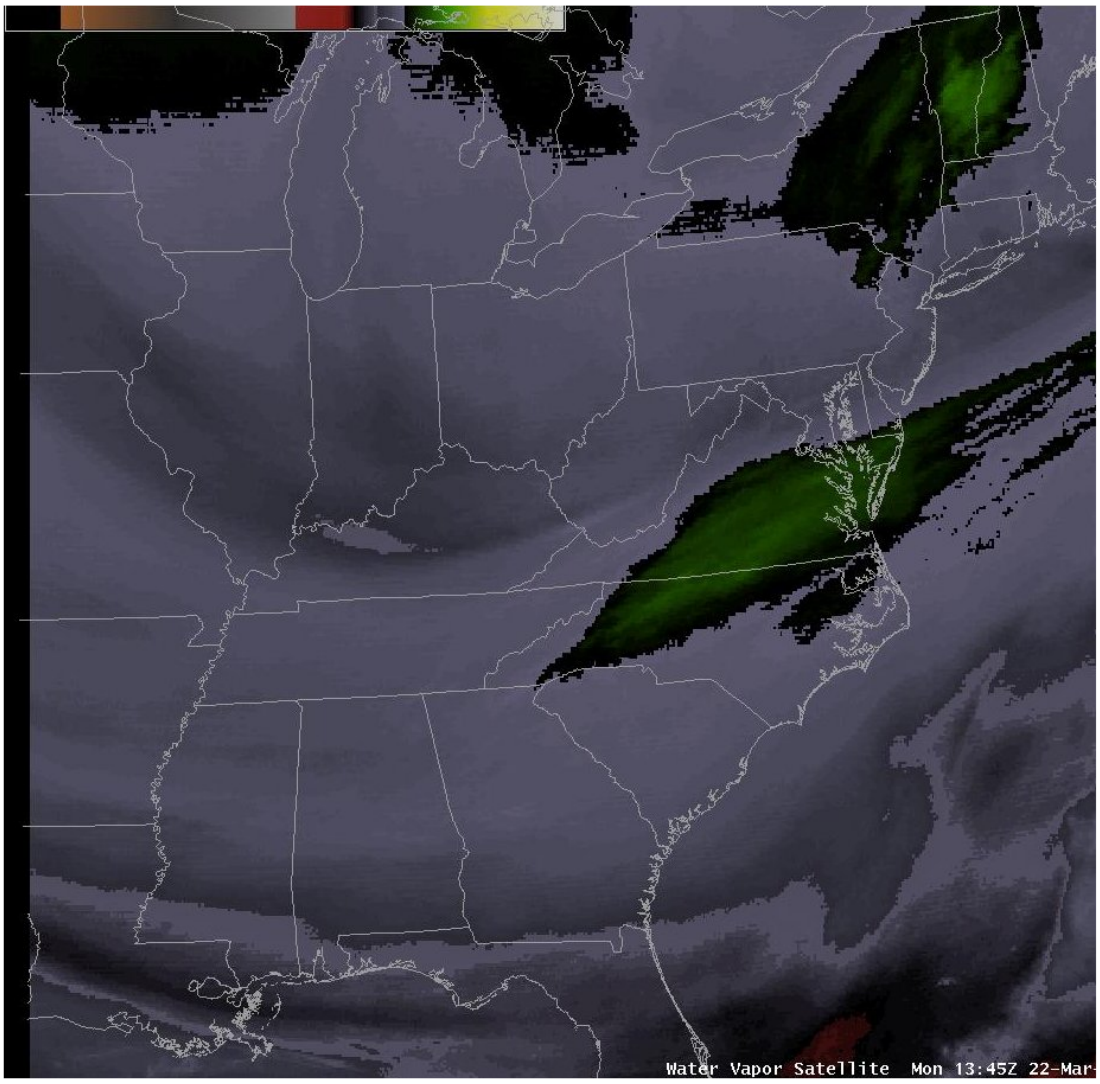
Synoptic Overview





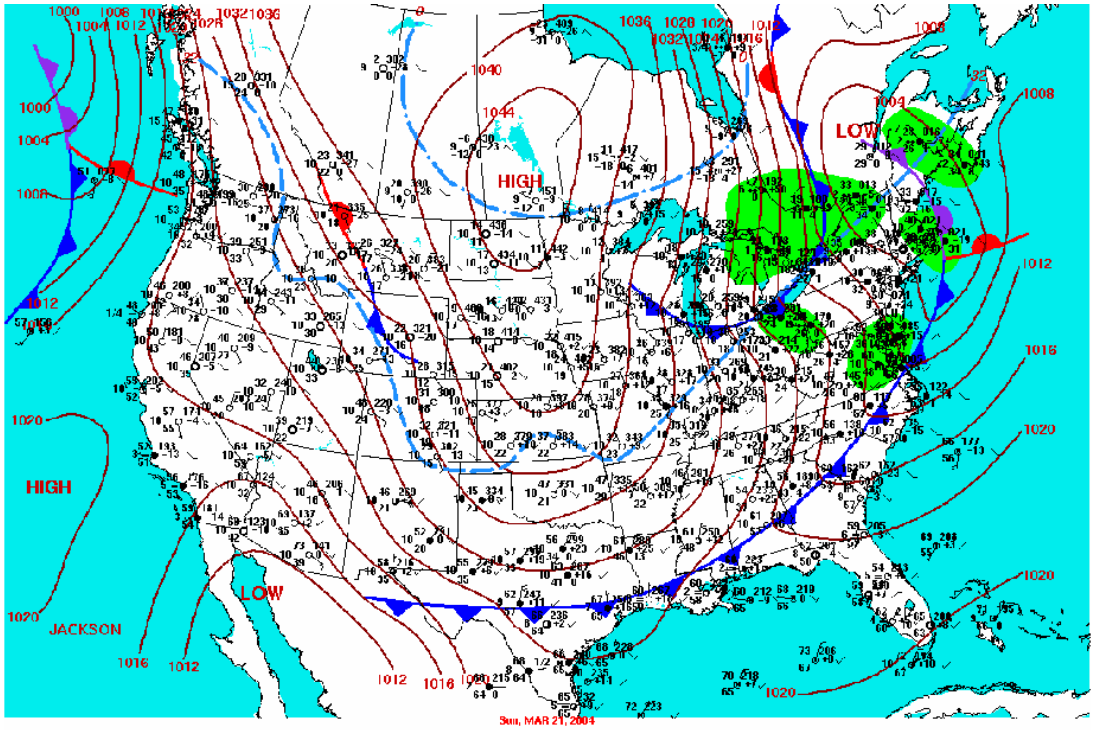


Upper left: Jet level winds, isotachs; Upper right: 500 Hgts/Vort, MSLP, 850 T; Lower left: Q-vec Div, mid-level omega, precip; Lower right: 850 RH, omega, winds.

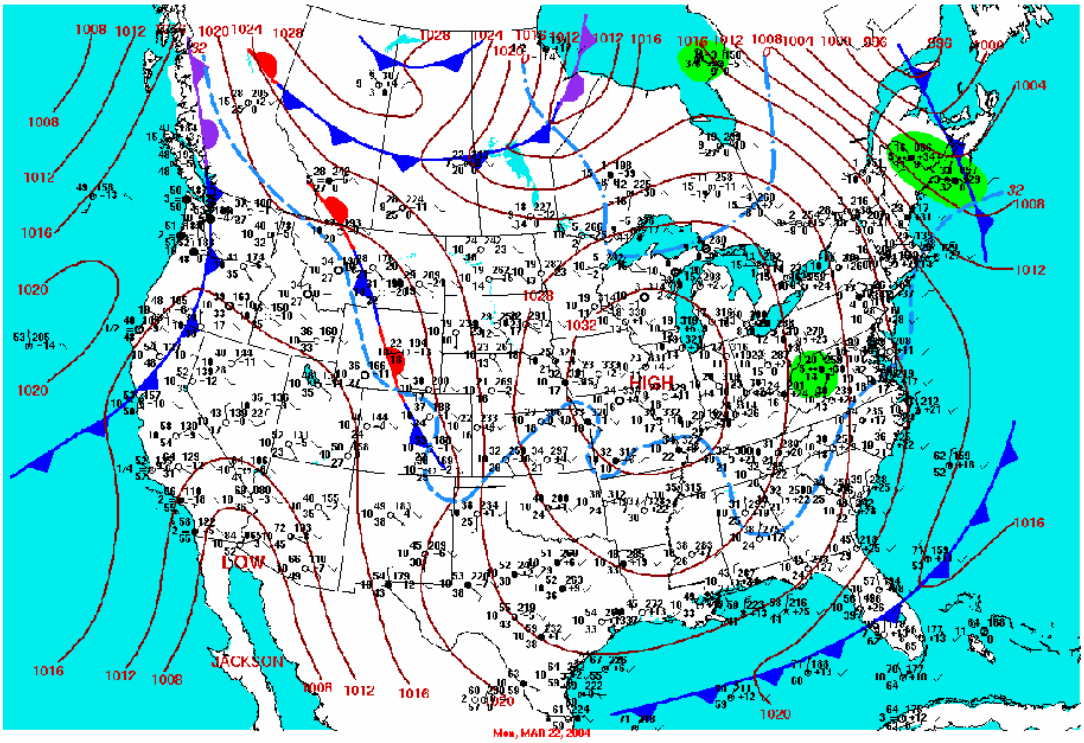


Enhanced area over VA/NC shows jet-associated lift, weak s/wv subsidence over KY/IN.

Surface Charts



Surface Weather Map and Station Weather at 7:00 A.M. E.S.T.



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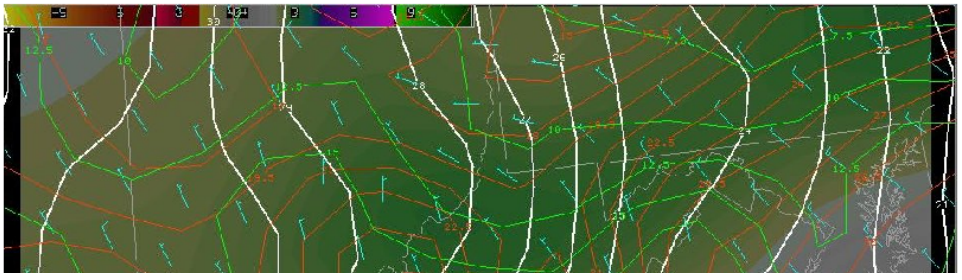
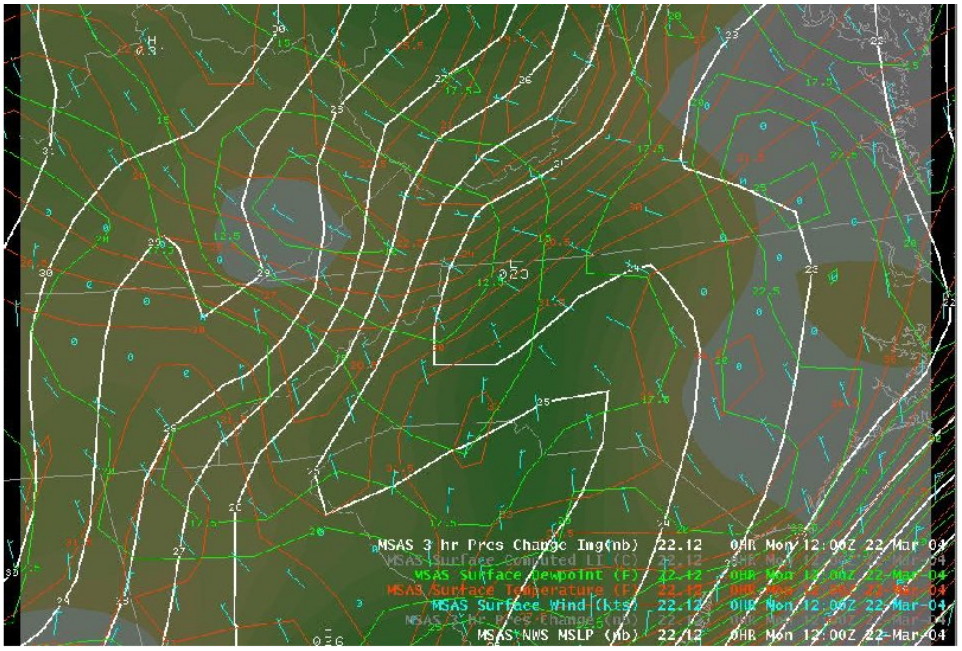
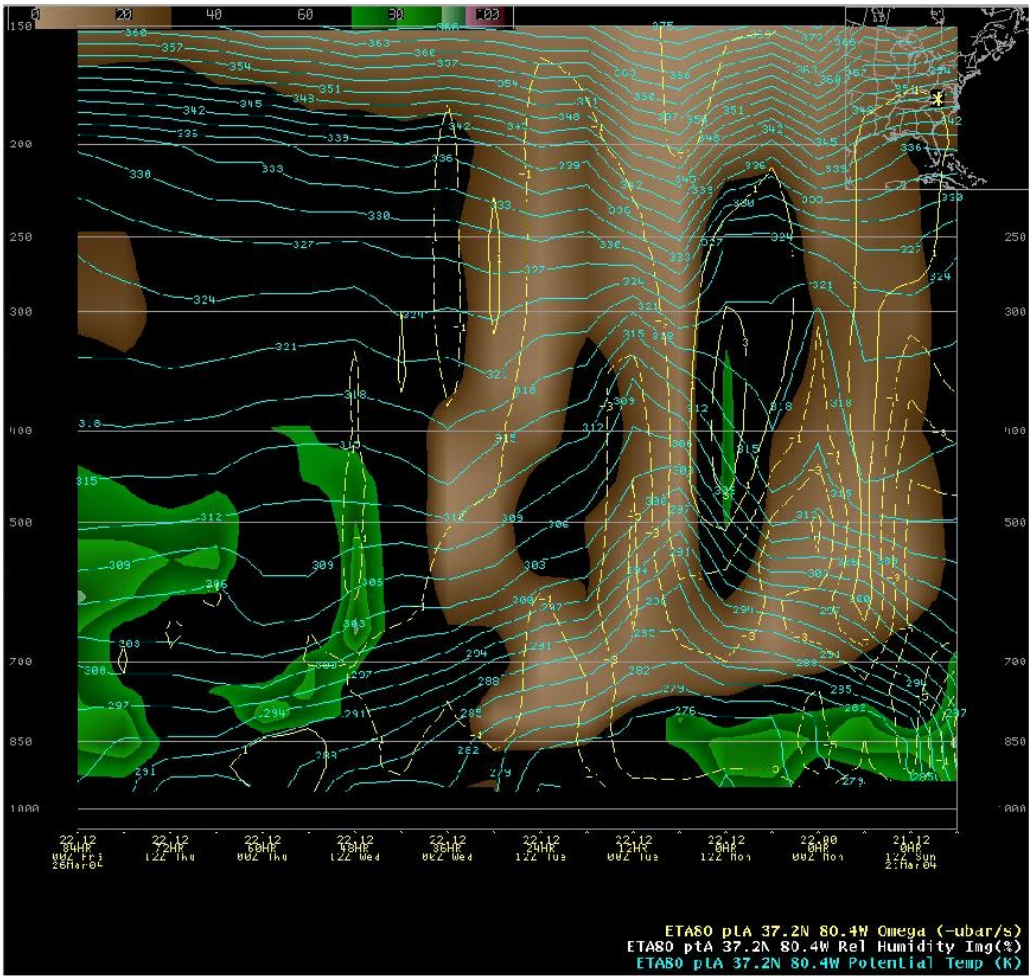


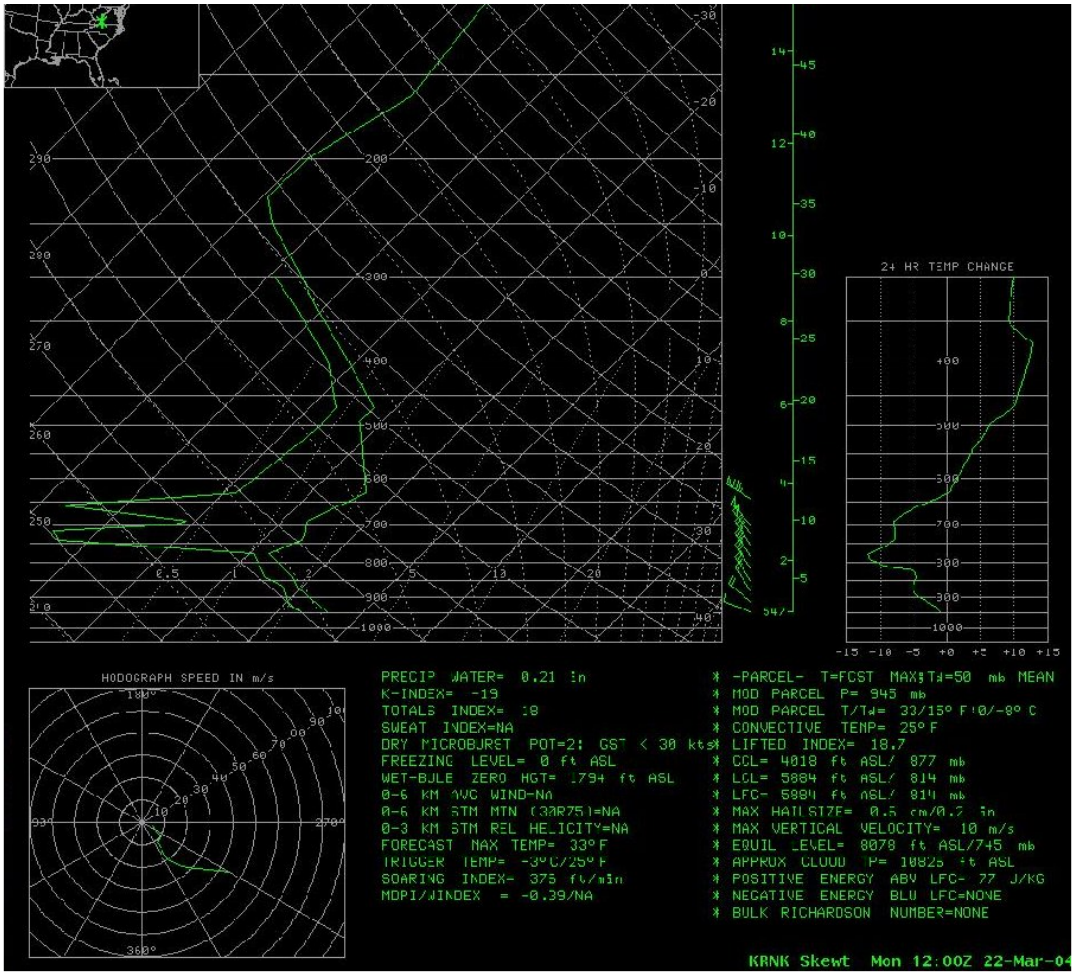


MSAS Analysis at 12Z March 22, 2004

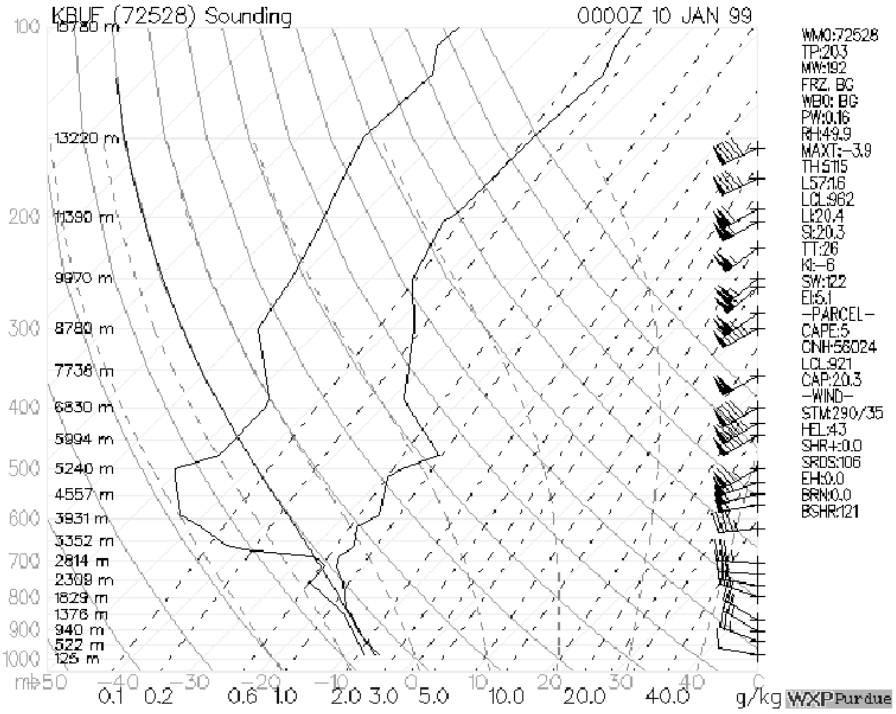
Vertical Structure



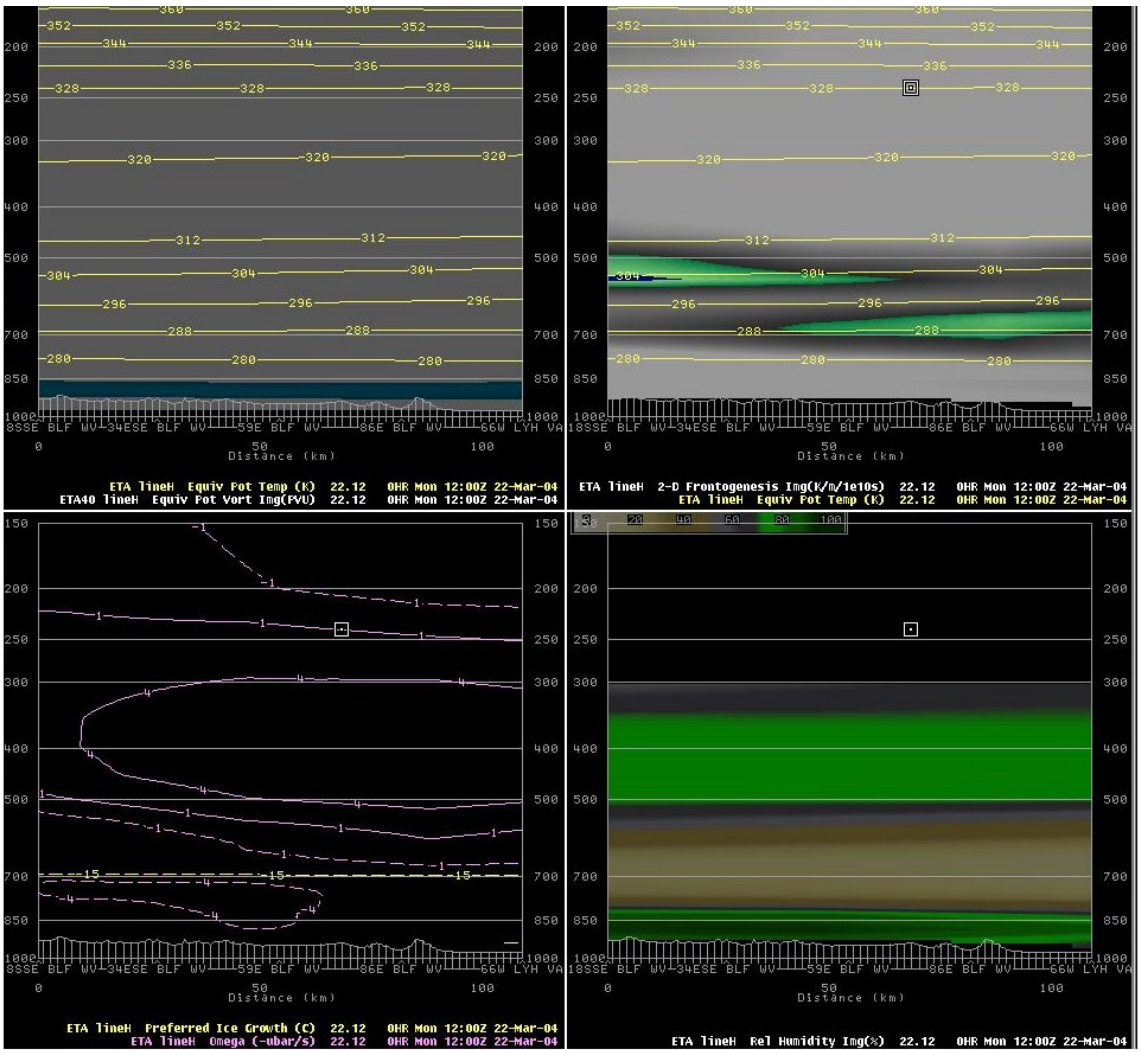
Time section near RNK shows deep stable dry layer over shallow adiabatic moist layer (sfc-800mb). Jet structure evident aloft with weak mid-level UVV.



Note shallow layer of instability, but also saturated in -10 to -18C zone. Also unidirectional wind shear.

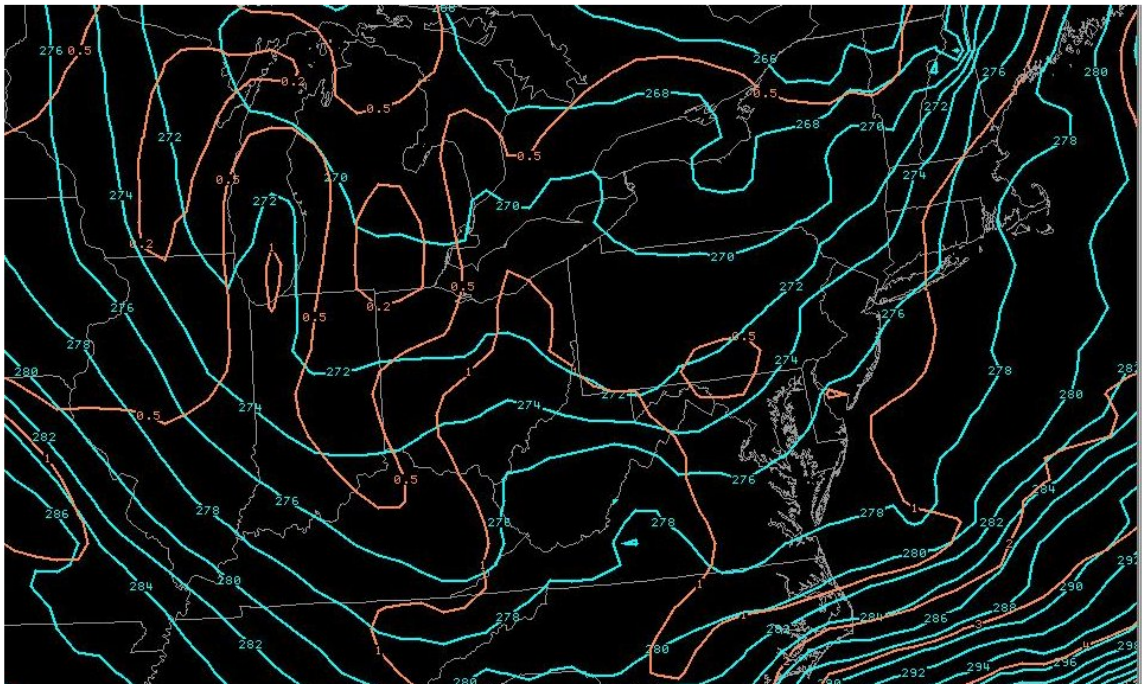


BUF sounding from a classic lake effect event, for comparison.

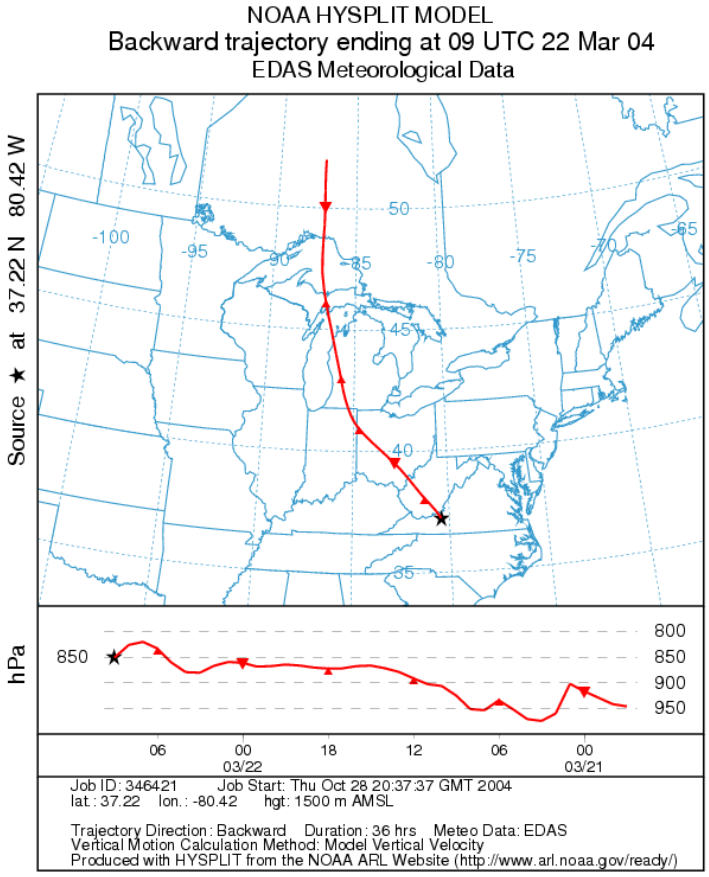


Upper left: Negative EPV is only in shallow adiabatic layer; Upper right: Weak frontogenesis is above unstable layer; Lower left: Weak mid-level omega; Lower right: Shallow moisture.

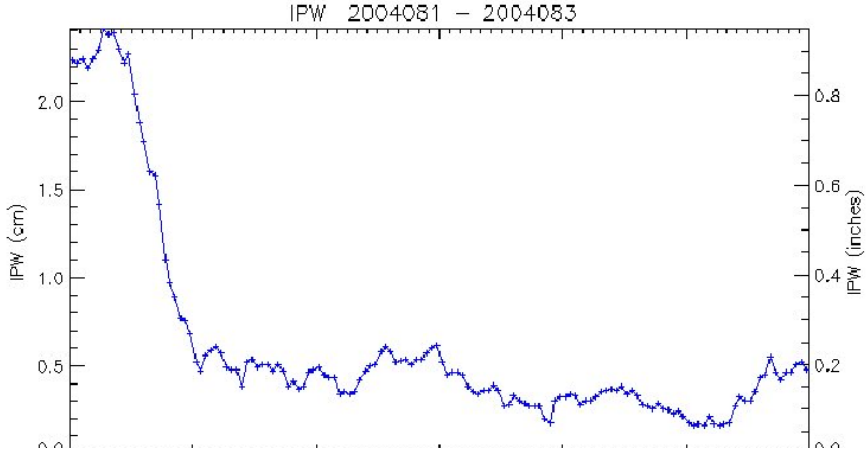
Low-level Moisture Availability

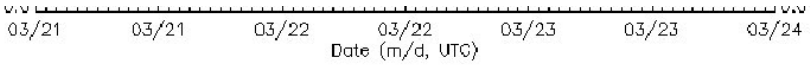


Eta analysis of 850 Specific Humidity. Despite very low values behind front, note local maxima over Lake Michigan, and well downstream from G.L region.



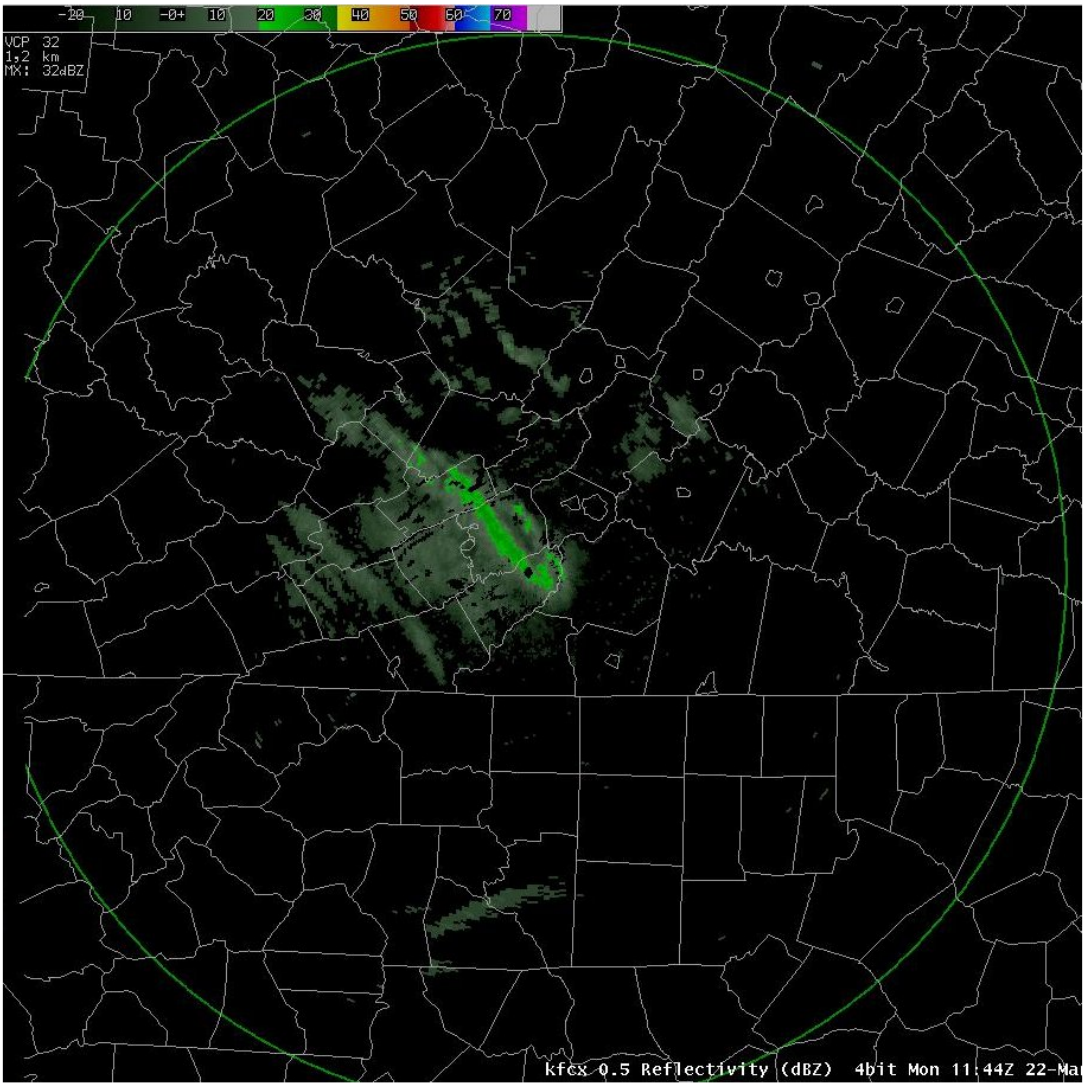
Hysplit backward trajectory from EDAS data for 09Z 3/22/04 for a parcel over Blacksburg at 850mb. Air mass over and near lake Michigan is near 960mb, with significant upslope over West Virginia.

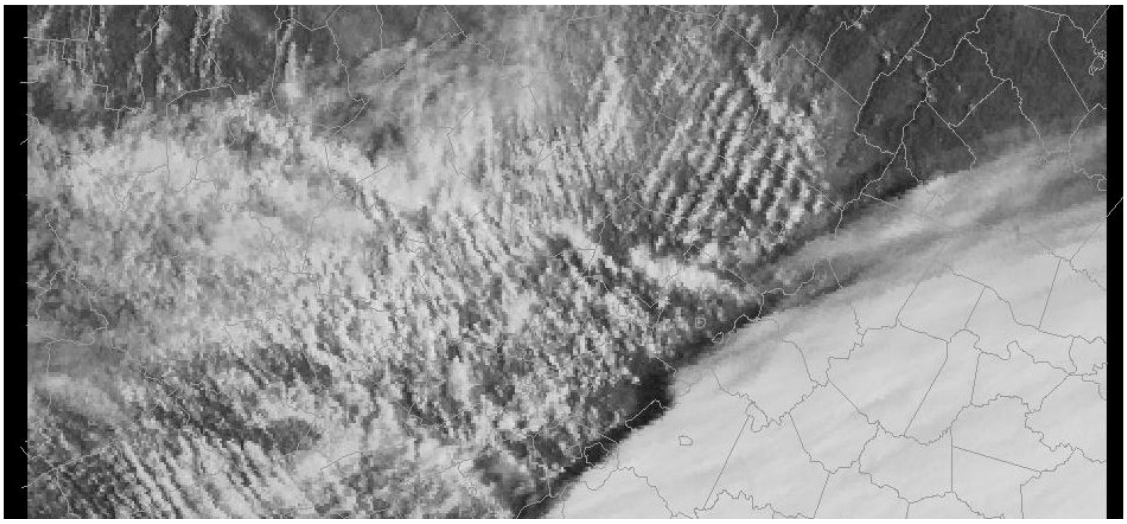


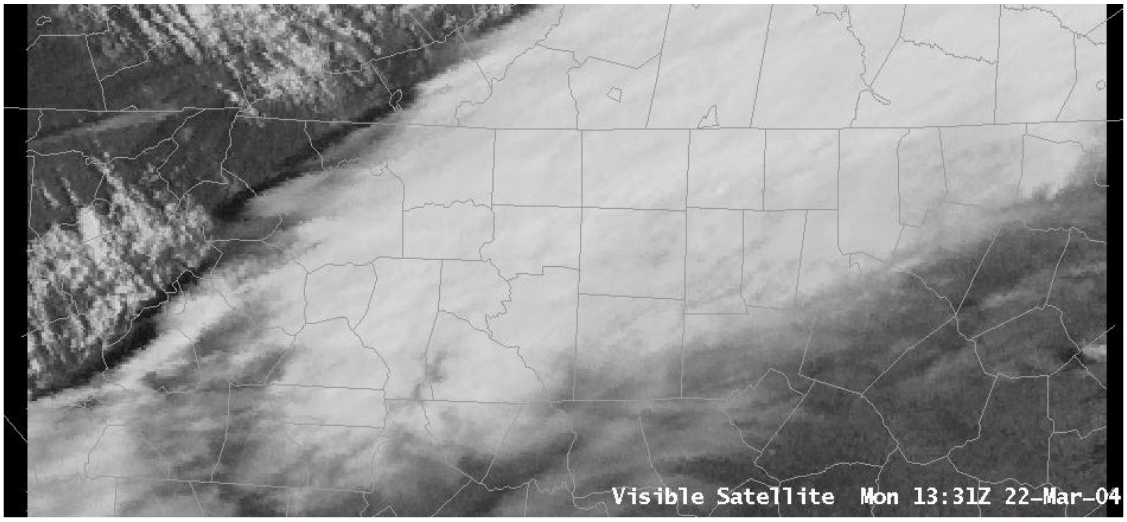


Blacksburg GPS IPW trace from March 21-23. Secondary but small maximum well behind front between 06Z and 12Z on the 22nd.

Result

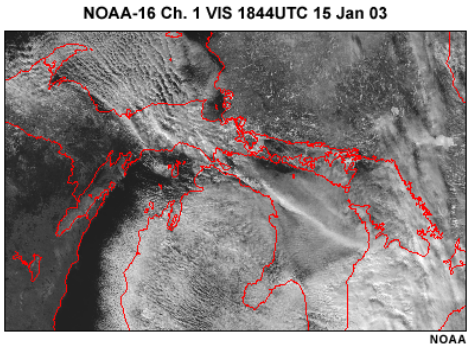






Note horizontal roll clouds parallel to flow (perpendicular to ridges), with embedded deeper bands, due to unstable layer. Evidence of stable layer just above the unstable layer seen in the wave cloud bands parallel to ridges across northern part of image.

Note horizontal roll clouds off Lake Superior and L. Michigan for comparison (date unknown)



Note the multiple bands coming off L. Superior, persisting across the UP of Michigan, and converging into a single band across L. Huron. Depth of unstable layer, unidirectional wind shear, and enhanced convergence due to the warm lake all may help produce the single band. Courtesy of COMET.

Concluding Remarks/Qstns ???

- **This event is <u>not</u> slantwise convection, but rather upright/gravitational convection, and does <u>not</u> appear to be forced by low-level frontogenesis**
- **Upslope flow probably plays a role, but bands extend well into New River Valley**
- **Depth of unstable layer may be key**
- **Favored ice crystal growth layer must be present in moist, unstable layer**
- **Unidirectional wind shear may also be important**
- **Need to examine trajectories in similar events and compare to events with scattered upslope snow showers or with only very shallow horizontal roll clouds present**

- **Do Great Lakes contribute in any way to shallow instability?**
- **Do Great Lakes contribute anything else (eg: CCN)?**
- **Does jet contribute enough lift for seeder ice crystals?**
- **What role does wind shear play in developing rolls, and is there an ideal configuration of the shear and instability profile to result in deeper bands and accumulating snow (vs. shallow roll clouds with no snow)?**

Click here for a great overview of lake effect process from COMET